

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) A heat-dissipation device for dissipating heat produced by at least one electronic component of an electronic control device, wherein the electronic control device includes a circuit board having the electronic component mounted thereon, and a protective case substantially confining the circuit board, the heat dissipation device comprising:

a heat conductive terminal connected to the circuit board in a position proximate to the electronic component, so that the heat of the electronic component is transferred or conducted to the heat conductive terminal;

~~wherein the heat conductive terminal contacts the protective case in order to thermally conduct the heat to the protective case~~

wherein the heat conductive terminal comprises:

a first end portion connected to the protective case in order to thermally conduct the heat to the protective case; and

a second end portion inserted into an insertion hole formed in the circuit board so as to be connected to an inner wall of the insertion hole;

a first heat conductive layer formed on the inner wall of the insertion hole, and

at least one second heat conductive layer disposed on or within the circuit board and connected to the first heat conductive layer, so that the heat

conducted or transmitted from the electronic component to the at least one second heat conductive layer is further conducted to the heat conductive terminal.

2. (Canceled).

3. (Canceled).

4. (Currently Amended) A heat-dissipating device as in claim [[3]] 1, wherein the second end portion of the heat conductive terminal is connected to the first heat conductive layer by a soldered portion.

5. (Original) A heat-dissipating device as in claim 4, wherein the at least one second heat conductive layer includes a top heat conductive layer, at least one intermediate heat conductive layer, and a bottom heat conductive layer, that are disposed on a top surface, an intermediate region, and a bottom surface of the circuit board, respectively.

6. (Original) A heat-dissipating device as in claim 5, wherein the circuit board further having at least one through hole formed in the circuit board extending throughout the thickness of the circuit board and disposed in close proximity to the electronic component, additionally includes:

a first electrical conductive layer formed on an inner wall of the through-hole;
and

a plurality of second electrically conductive layers including a top electrically conductive layer, at least one intermediate electrically conductive layer, and a bottom electrically conductive layer that are disposed on a top surface, an intermediate region, and a bottom surface of the circuit board, respectively, wherein at least two of the second electrical conductive layers are connected to each other via the first electrically conductive layer.

7. (Original) A heat-dissipating device as in claim 6, wherein the top electrically conductive layer is connected to at least one of the intermediate electrically conductive layer and the bottom electrically conductive layer, so that the heat produced by the electronic component is conducted to the top electrically conductive layer and then to the at least one of the intermediate electrically conductive layer and to the bottom electrically conductive layer, via the first electrically conductive layer.

8. (Currently Amended) A heat-dissipating device ~~as in claim 7, wherein~~ the top heat conductive layer and the top electrically conductive layer are made of the same material and are formed simultaneously with each other for dissipating heat produced by at least one electronic component of an electronic control device, wherein the electronic control device includes a circuit board having the electronic component mounted thereon, and a protective case substantially confining the circuit board, the heat dissipation device comprising:

a heat conductive terminal connected to the circuit board in a position proximate to the electronic component, so that the heat of the electronic component is transferred or conducted to the heat conductive terminal;

wherein the heat conductive terminal comprises;

a first end portion connected to the protective case in order to thermally conduct the heat to the protective case, and

a second end portion inserted into an insertion hole formed in the circuit board so as to be connected to an inner wall of the insertion hole,

a first heat conductive layer formed on the inner wall of the insertion hole, and second heat conductive layers including a top heat conductive layer, at least one intermediate heat conductive layer, and a bottom heat conductive layer disposed on a top surface, an intermediate region, and a bottom surface of the circuit board, respectively, the second heat conductive layers being connected to the first heat conductive layer so that the heat conducted or transmitted from the electronic component to the second heat conductive layers is further conducted to the heat conductive terminal,

at least one through hole formed in the circuit board extending throughout the thickness of the circuit board and disposed in close proximity to the electronic component,

a first electrical conductive layer formed on an inner wall of the through-hole;
and

second electrical conductive layers including a top electrically conductive layer, at least one intermediate electrically conductive layer, and a bottom electrically conductive layer that are disposed on the top surface, the intermediate region, and

the bottom surface of the circuit board, respectively, wherein at least two of the second electrical conductive layers are connected to each other via the first electrically conductive layer;

wherein the second heat conductive layer and the second electrical conductive layer disposed on the same surface or region of the circuit board are made of the same material, formed simultaneously with each other, and separated from each other electrically.

9. (Canceled).

10. (Canceled).

11. (Canceled).

12. (Canceled).

13. (Canceled).

14. (Original) A heat-dissipating device as in claim 1, wherein the protective case includes a case body and a case cover, the case body is made of metal, and the circuit board is mounted to and within the case body.

15. (Original) An electronic control device comprising the heat-dissipating device as in claim 14.

16. (Currently Amended) A heat-dissipating device ~~as in claim 3, for~~
dissipating heat produced by at least one electronic component of an electronic
control device, wherein the electronic control device includes a circuit board having
the electronic component mounted thereon, and a protective case substantially
confining the circuit board, the heat dissipation device comprising:

a heat conductive terminal connected to the circuit board in a position
proximate to the electronic component, so that the heat of the electronic component
is transferred or conducted to the heat conductive terminal;

wherein the heat conductive terminal further comprises:

a first end portion connected to the protective case in order to thermally
conduct the heat to the protective case, and

a second end portion inserted into an insertion hole formed in the circuit board
so as to be connected to an inner wall of the insertion hole,

a first heat conductive layer formed on the inner wall of the insertion hole, and
at least one second heat conductive layer disposed on or within the circuit
board and connected to the first heat conductive layer so that the heat conducted or
transmitted from the electronic component to the at least one second heat
conductive layer is further conducted to the heat conductive terminal;

wherein the second end portion further includes;

a first protrusion contacting a top surface of the circuit board,

a second protrusion contacting a bottom surface of the circuit board,

and

wherein the heat conductive terminal is fixed in position relative to the
insertion hole via the first and second protrusions,

wherein the second end portion directly contacts the first heat conductive layer; and

wherein the first and second projections are made of the same material as the second end portion and are formed integrally with the second end portion.

17. (Original) A heat-dissipating device as in claim 16, wherein the at least one second heat conductive layer includes a top heat conductive layer, at least one intermediate heat conductive layer, and a bottom heat conductive layer, that are disposed on a top surface, an intermediate region, and a bottom surface of the circuit board, respectively.

18. (Original) A heat-dissipating device as in claim 17, wherein the circuit board further having at least one through hole formed in the circuit board extending throughout the thickness of the circuit board and disposed in close proximity to the electronic component, additionally includes:

a first electrical conductive layer formed on an inner wall of the through-hole;
and

a plurality of second electrically conductive layers including a top electrically conductive layer, at least one intermediate electrically conductive layer, and a bottom electrically conductive layer that are disposed on a top surface, an intermediate region, and a bottom surface of the circuit board, respectively, wherein at least two of the second electrical conductive layers are connected to each other via the first electrically conductive layer.

19. (Original) A heat-dissipating device as in claim 18, wherein the top electrically conductive layer is connected to at least one of the intermediate electrically conductive layer and the bottom electrically conductive layer, so that the heat produced by the electronic component is conducted to the top electrically conductive layer and then to the at least one of the intermediate electrically conductive layer and to the bottom electrically conductive layer, via the first electrically conductive layer.

20. (Original) A heat-dissipating device as in claim 19, wherein the protective case includes a case body and a case cover, the case body is made of metal, and the circuit board is mounted to and within the case body.

21. (New) A heat-dissipating device as in claim 16, wherein the first and second projections are formed by bending parts of the second end portion of the heat conductive terminal.